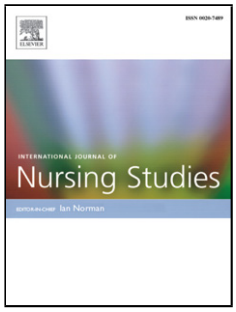

Title: The primacy of vital signs–Acute care nurses' and midwives' use of physical assessment skills: A cross sectional study

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- Despite the growing body of research on hospital-wide systems designed to improve early recognition and response to patient deterioration, findings are mixed and expected improvements in patient survival has not been consistently realised.
- Ward-level nursing surveillance is essential to detect patients at risk of clinical deterioration, but we know little about the assessment activities of acute care registered nurses and midwives.
- On average, registered nurses/midwives use a small set of core physical assessment skills augmented by a cluster of additional core skills relevant to their specialty area.
- Controlling for clinical role and clinical work area, perceived lack of confidence and reliance on others and technology are significant predictors of the physical assessment skill use of acute care nurses and midwives.
- The findings of this research indicate that nursing practice is directed toward collecting and reporting minimal data that will detect end stages of clinical deterioration. We argue that this, in part, is a response to the current hospital safety agenda, which is driven by early warning and rapid response systems, and relies on nurses collecting data according to predefined parameters rather than concentrating on assessment of patient health status.

Title

The primacy of vital signs – Acute care nurses' and midwives' use of physical assessment skills: A cross sectional study

Short Title

Physical Assessment Practices of Acute Care Nurses and Midwives

Author(s)

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Responsibility for this article rests with the named authors.

Key Words:

acute care, barriers to physical assessment, clinical deterioration, health assessment, hospital rapid response team, nursing assessment, nursing observation, physical assessment, physical examination, vital signs

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The primacy of vital signs – Acute care nurses' and midwives' use of physical assessment skills: A cross sectional study

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Key Words

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Contribution of the Paper

What is already known about the topic?

- Despite the growing body of research on hospital-wide systems designed to improve early recognition and response to patient deterioration, findings are mixed and expected improvements in patient survival has not been consistently realised.
- Ward-level nursing surveillance is essential to detect patients at risk of clinical deterioration, but we know little about the assessment activities of acute care registered nurses and midwives.

What this paper adds?

- On average, registered nurses/midwives use a small set of core physical assessment skills augmented by a cluster of additional core skills relevant to their specialty area.
- Controlling for clinical role and clinical work area, perceived lack of confidence and reliance on others and technology are significant predictors of the physical assessment skill use of acute care nurses and midwives.
- The findings of this research indicate that nursing practice is directed toward collecting and reporting minimal data that will detect end stages of clinical deterioration. We argue that this, in part, is a response to the current hospital safety

agenda, which is driven by early warning and rapid response systems, and relies on nurses collecting data according to predefined parameters rather than concentrating on assessment of patient health status.

ABSTRACT

BACKGROUND: Registered nurses and midwives play an essential role in detecting patients at risk of deterioration through ongoing assessment and action in response to changing health status. Yet, evidence suggests that clinical deterioration frequently goes unnoticed in hospitalised patients. While much attention has been paid to early warning and rapid response systems, little research has examined factors related to physical assessment skills.

OBJECTIVES: To determine a minimum data set of core skills used during nursing assessment of hospitalised patients and identify nurse and workplace predictors of the use of physical assessment to detect patient deterioration.

DESIGN: The study used a single-centre, cross-sectional survey design.

SETTING and PARTICIPANTS: The study included 434 registered nurses and midwives (Grades 5-7) involved in clinical care of patients on acute care wards, including medicine, surgery, oncology, mental health and maternity service areas, at a 929-bed tertiary referral teaching hospital in Southeast Queensland, Australia.

METHODS: We conducted a hospital-wide survey of registered nurses and midwives using the 133-item *Physical Assessment Skills Inventory* and the 58-item *Barriers to Registered Nurses' Use of Physical Assessment* scale. Median frequency for each physical assessment skill was calculated to determine core skills. To explore predictors of core skill utilisation, backward stepwise general linear modelling was conducted. Means and regression coefficients are reported with 95% confidence intervals. A p value < .05 was considered significant for all analyses.

RESULTS: Core skills used by most nurses every time they worked included assessment of temperature, oxygen saturation, blood pressure, breathing effort, skin, wound and mental status. Reliance on others and technology ($F = 35.77$, $p < .001$), lack of confidence ($F = 5.52$, p

= .02), work area (F = 3.79, p = .002), and clinical role (F = 44.24, p < .001) were significant predictors of the extent of physical assessment skill use.

CONCLUSIONS: The increasing acuity of the acute care patient plausibly warrants more than vital signs assessment; however, our study confirms nurses' physical assessment core skill set is mainly comprised of vital signs. The focus on these endpoints of deterioration as dictated by early warning and rapid response systems may divert attention from and devalue comprehensive nursing assessment that could detect subtle changes in health status earlier in the patient's hospitalisation.

INTRODUCTION

The changing profile of hospitalised patients means sicker patients with more complex needs are at greater risk of becoming seriously ill during their hospital stay. Rates of unanticipated in-hospital morbidity and mortality have been estimated between 12-48% (Buist, Bernard, Nguyen, Moore, & Anderson 2004; Jacques, Harrison, McLaws, Kilborn 2006; Kause, Smith, Prytherch, Parr, Fabouris, Hillman 2004). A deteriorating patient moves from one clinical state to a worse clinical state, increasing their individual risk of morbidity and death (Jones, Mitchell, & Hillman, 2013, p1031). Missed signs of deteriorating health status can result in a failure to rescue patients from clinical deterioration and subsequent poorer outcomes (Chan, Jain, Nallmothu, Berg, & Sasson, 2010; McGaughey, Fowler, Mayhew, & Moutray, 2009; Silber, Williams, Krakauer, & Schwartz 1992).

In response to the changing acuity of hospital ward patients there has been a focus on the patient safety and quality agenda and imperatives for efficient and effective health service systems. Government agencies worldwide have promoted and commissioned guidelines for recognition of and response to acute clinical deterioration (ACSQQH 2012; IHI 2008; NICE 2007). Globally, these hospital safety initiatives have resulted in the uptake of early warning systems and rapid response teams to recognise and respond to clinical deterioration. Early warning systems and rapid response teams are predicated on the recognition of predetermined criteria to alert special teams (e.g. rapid response teams (RRT), medical emergency teams (MET), critical care outreach teams (CCOT)) to attend to and intervene in situations where physiological indicators of patients' health status lie within the parameters of predetermined criteria. Despite the prolific and growing body of literature on the institution-wide implementation of a systems approach to clinical deterioration, the state of the science generally remains inconclusive on the effectiveness of these initiatives (Chan, Jain,

Nallmothu, Berg, Sasson 2010; Gao, McDonnell, Harrison, Moore, Adams, Daly, Goldhill, et al 2007; McGaughey, et al., 2009; McNeill & Bryden 2013; Ranji, Auerbach, Hurd, O'Rourke, Shojana 2007;Winters, Weaver, Pfoh, Yang, Pham, Dy 2013). Although beneficial effects of rapid response systems are becoming more apparent in some local contexts, these benefits are not achieved consistently by all programs (Chan et al 2010, Winters et al 2013).

It has been known for some time that patients exhibit signs of clinical deterioration prior to cardiac arrest, unplanned ICU admission or death, and these signs are often not recognised or acted upon (Hogan 2006, Buist, et al 2004; Franklin and Matthew 1994; Goldhill and McNarry 2004; Lighthall, Markar, & Husiung 2009; Schein, et al 1990). Moreover, several large prospective, observational studies identified changes in vital signs, such as blood pressure, respiratory rate, heart rate, arterial oxygen saturation and level of consciousness, as the most common predictors of clinical deterioration (Buist, Vernard, Nguyen, Moore, Anderson 2004; Kause, Smith, Prytherch, Parr, Fabouris, Hillman 2004; Lighthall et al 2009). Most early warning systems and rapid response teams are based upon vital signs observations and the recognition of abnormal vital signs to trigger the response.

Clinical frontline nurses play an essential role in detecting changes in patients' health status through ongoing health assessment and timely, appropriate action in response to changes, or deterioration, in health status (Considine & Botti 2004; Odell, Victor, & Oliver, 2009; Yeung, Lapinsky, Granton, Doran , & Cafazzo 2012). Despite the centrality of health assessment in nursing education, previous research suggests that only 11-29% of the physical assessment skills taught in nursing programs are regularly used by RNs in practice (Secrest 2005; Giddens 2007; Birks et al 2012). Questions were raised about the need for nursing students to learn such a large range of physical assessment skills to practice nursing – skills which were derived from a medical model and whereby only a small set of these skills were used in

practice (Secrest 2005; Giddens 2007). Alternative explanation has been offered in that, perhaps, nurses were not being used to their full capacity (Giddens 2007). Birks et al (2012) later argued that the relevance of the skill may have little bearing on frequency of skill use and other issues, such as time pressures, area of practice, and clarity of practice scope, may have more impact.

The literature is clear that surveillance is essential to detect patients at risk of clinical deterioration, but we know little about the assessment activities of acute care registered nurses and midwives and less about the organisational and contextual factors that influence assessment practices. The assessment activities of the registered nurse in detecting subtle cues or cue clusters of a deteriorating clinical situation, and the action that follows, can have an immediate impact on patient outcome (Yeung, Lapinsky, Granton, Doran, & Cafazzo 2012). These actions may be the key to understanding why some patients do well and others experience complications during the course of their care. Knowing and understanding what core physical assessment skills registered nurses/midwives consistently perform as well as their attitude and beliefs about physical assessment will advance our understanding of this practice activity that is so central to patient care. This study is part of a larger research program exploring nursing and midwifery assessment practices. The objectives of this study were: (1) to explore the scope of physical assessment practices of acute care registered nurses and midwives to determine a minimum data set of core skills used during nursing assessment of hospitalised patients; and (2) to identify nurse and workplace predictors of the use of physical assessment. Findings from this study will extend understanding of clinical frontline nurses' and midwives' capacity to rescue, which will have further implications for patient safety related to recognition and response to clinical deterioration of hospitalised patients in acute care wards.

METHODS

Study Design

A single-centre, cross-sectional survey design was used to explore nursing assessment practices.

Setting

The study was conducted at a 929-bed, quaternary and tertiary referral teaching hospital in Southeast Queensland, Australia. The hospital provides most major health specialties including medicine, surgery, mental health, oncology, maternity services, trauma services and more than 30 subspecialties. It is typical of quaternary hospitals across Australia in terms of size, average length of stay, cost-per case mix adjusted separations, emergency room waiting times, and hospital separations with an adverse event (AIHW 2004).

Participants

We conducted a hospital-wide survey of the population of registered nurses/midwives involved in the clinical care of patients on acute care wards. From a total of 106 units in the hospital, the eligible sampling frame was 40 acute care areas. Eligible participants included all Grades 5–7 registered nurses and midwives, including clinical specialists and advanced practice nurses (definitions for grades of nursing practice are available at http://www.health.qld.gov.au/qhpolicy/docs/pol/qh-pol-179.pdf) working in acute care areas in medicine, surgery, oncology, mental health and maternity service areas. We excluded critical care areas, operating rooms or ambulatory service delivery because our focus was acute ward environments where nurse-patient ratios, level of support and expertise may differ.

Sample size

Sample size estimation was calculated using Cochran's (1977) formula and a table derived by Bartlett, Kotrick and Higgins (2001) to provide a confidence level of 95% (alpha 0.05) and

power of 80%, and with a margin of error of 0.03 for continuous data and 0.05 for categorical data. A sample of at least 260 participants was required for analysis of categorical data and 120 participants for continuous data.

Data collection

Recruitment and data collection occurred between June and July 2013. Prior to commencement of the study, information sessions were conducted on eligible wards by members of the research team. These sessions provided information on the purpose of the research and the process for participation. All registered nurses/midwives on eligible wards were identified by nurse unit managers using rosters generated by each work unit. A coded survey package containing study information for participants, a questionnaire and a return self-addressed envelope was sent to all eligible registered nurses/midwives through the internal mail system. Alternatively, participants were advised they could complete an online version of the survey on the hospital intranet site advertised by screensavers and posters in clinical areas. In both cases, participation was voluntary and participants were advised that returning the questionnaire implied consent to participate in the study. As an incentive to improve the response rate, respondents could enter a random prize draw to win a tablet computer at the end of the data collection period.

In order to improve the response rate, we adapted Dillman's Tailored Design Method (Dillman 2011); incorporating several proven strategies, such as user-friendly survey design, multiple contacts, personalised correspondence, return envelopes, and participant incentive (McColl, Jacoby, Thomas, Soutter, Bamford, Steen, et al 2001; VanGeest , Johnson & Welch 2007). In addition, we offered multiple options (Archer 2007) to complete a web-based version of the survey, via a link on the hospital intranet or via a travelling survey kiosk using a mobile tablet. The study was conducted in accordance with the code of ethics of the World Medical Association (2013) Declaration of Helsinki and all study procedures were approved by the

relevant hospital and university human research ethics committees. No external funding was received for this study.

Outcome measures

The variables of interest in this study were: (1) registered nurse/midwife frequency of use of physical assessment skills, and (2) factors that influence registered nurses/ midwives' physical assessment activities in the acute care hospital ward as measured. Data were collected for this part of the study using the *Physical Assessment Skills Inventory* and the *Barriers to Registered Nurses' Use of Physical Assessment scale* (Douglas, Osborne, Reid, Batch, Hollingdrake, & Gardner 2014). Additional questions were included to collect demographic data on age sex, highest educational qualification, years of nursing experience and experience with current employer, work status (full time, part time, casual), clinical area, and nursing work role. There was also an opportunity for participants to provide any additional free text comments.

Physical Assessment Skills Inventory

The *Physical Assessment Skills Inventory* was based on a survey instrument developed by Giddens (2007) and later modified by Birks et al (2012). The instrument was adapted for this study with permission from the authors to ensure relevance to the contemporary Australian context. The original instrument is a 126-item survey designed to explore registered nurses/midwives' knowledge and frequency of use of physical assessment skills, grouped according to 15 body regions/systems, and including inspection, palpation, percussion and auscultation skills. Participants were asked to indicate the frequency with which they performed each skill using a 6-point Likert response scale: 0 = *I do not know how* to do this skill, 1 = *I know how* to do this skill, but have *never* done this in my clinical practice, 2 = I perform this skill *rarely* (a few times during my career), 3 = I perform this skill *occasionally* (a few times a year), 4 = I perform this skill *frequently* in my clinical practice (every 2-5 times I work), 5 = I perform this skill *regularly* in my clinical practice (every time I work).

Our modified instrument contained 133 items reflecting, some regrouping of items, three items added by Birks et al (2012) and the addition of four new items related to vital signs: "determining temperature using a thermometer", "oxygen saturation using pulse oximetry", "blood pressure using sphygmomanometer", and "blood pressure using automatic equipment". A final item "inspect skin integrity" was also added. Skills were grouped under the following categories: vital signs, integument, nutrition, head, ears, eyes, neck and thorax, cardiovascular, back and spine, musculoskeletal, abdomen, breasts, genitalia and reproductive (female and male), anus/rectum/prostate, and neurological (central nervous system, cerebellar function, and sensory function). Content and face validity was evaluated by a panel of eight nurses/midwives with expertise in the area, including nurse managers, educators and researchers from the target population, and nursing academics responsible for teaching undergraduate and postgraduate health assessment; after which one final modification was made, i.e. "palpate pericardium (heart)" was changed to "palpate apical pulse or precordium (heart)."

Barriers to Registered Nurses' Use of Assessment Skills Scale

The *Barriers to Nurse's Use of Physical Assessment Scale* (Douglas et al 2014) was developed for use in this study to measure registered nurses/midwives' perceptions of attitudes and barriers to the use of physical assessment skills in the acute care setting. The original instrument contained 52 items and participants were asked to indicate the extent to which they agreed each item applied to their practice on a 5-point Likert response scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Following psychometric testing, the 38 remaining instrument items factored into seven subscales: (1) reliance on others and technology, (2) lack of time and interruptions, (3) ward culture, (4) lack of confidence, (5) lack of nursing role models, (6) lack of influence on patient care, and (7) specialty area. Internal

consistency was established for subscales with Cronbach's coefficient alpha ranging from 0.70 to 0.86 (Douglas et al 2014).

Statistical Methods

Data were imported into IBM SPSS Statistics for Windows (version 21) for analysis. Descriptive statistics were used to summarise the sample characteristics and to examine the use of physical assessment skills. Given the ordinal measurement of skill utilisation, we calculated the median frequency for each physical assessment skill and determined core skills as those with a median frequency of 5, that is, skills performed on average every time registered nurses/midwives worked (regularly).

To explore predictors of core skill utilisation, the number of core skills was logarithmically transformed to produce a normally distributed outcome variable. Back transformed (geometric) means and 95% confidence intervals are also reported. Respondents who did not respond to at least 100 of the skills were excluded from this analysis. First, mean core skill utilisation was compared by nurse and work characteristics using ANOVAs. Associations between use of core skills and barrier subscales were explored using Pearson's correlations, and linear regression was used to adjust for clinical role and work area. Finally, to identify significant predictors of core skill utilisation, a backward stepwise general linear model was conducted including all nurse/midwife and workplace characteristics and perceived barriers to physical assessment. Nurses division of work was set as a random effect to account for any clustering effect. Means and regression coefficients (b) are reported with 95% confidence intervals. A p value < .05 was considered significant for all analyses.

RESULTS

Nurse and workplace characteristics

Of the 1,591 surveys distributed, 183 were returned unopened; this was primarily due to staff on leave or no longer working in that area. A total of 434 acute care registered nurses/midwives completed the survey (see Table 1), giving a response rate of 30.8%. The mean age was 38.9 years (SD = 11.5). The majority of the sample were female (90.6%), university-prepared (62.4%) and spoke English as a first language (85.7%). In terms of clinical roles, most participants identified as registered nurse/midwife (Grade 5, 65.2%) or clinical nurse (Grade 6, 22.1%), working in surgical (32.5%) or medical (27.4%) wards, and were employed part-time (53.7%). The sample had an average of 13.7 years (SD = 10.8) of clinical experience and 8.5 years (SD = 6.8) of employment at the study hospital.

Table 1 Sample Characteristics (N=434)

Characteristics	*n*	%
Sex		
Female	393	90.6
Male	40	9.2
Age		
Mean, *SD*	38.9	11.5
Highest level of education		
Hospital certificate	59	13.6
Bachelor's degree	271	62.4
Postgraduate	99	22.8
English first language		
Yes	372	85.7
No	59	13.6
Clinical role		
Registered Nurse/Midwife (Grade 5)	283	65.2
Clinical Nurse/Midwife (Grade 6)	96	22.1
Nurse Unit Managers, Clinical Nurse Consultants, Nurse Educators, Nurse Researchers (Grade 7[a])	47	10.8
Work area currently employed		
Surgical	141	32.5
Medical	119	27.4
Maternity	57	13.1
Oncology	42	9.7
Mental health	34	7.8
Other	38	8.7
Employment status		
Full-time	191	44.0
Part-time	233	53.7
Years of experience as RN		
Mean, *SD*	13.7	10.8
≤ 3	69	15.9
4-5	50	11.5
6-9	70	16.1
≥ 10	232	53.5

[a] Grade 7 = advanced practice roles. *Note: For any one category, when raw numbers are less than 100% of total (N=434), this reflects missing data at the individual level. Missing data in any category is <1%.*

Extent of physical assessment skills utilised regularly in practice

The study aimed to identify physical assessment skills used regularly (core) in practice across all specialities. We determined core skills as those with a median frequency of 5, indicating skills performed on average every time registered nurses/midwives worked. On average, the sample regularly performed 10 (7.5%) of the 133 skills surveyed. These were predominately vital signs captured in hospital observation and early warning system charts including measurement of body temperature, blood pressure (manual and automatic), breathing effort (rate, patterns and chest expansion), oxygen saturation, and mental status/level of consciousness. Additional core skills included skin inspection (colour/tone, integrity, lesions), and inspection of wounds.

Table 2 presents the core skills for the sample by each clinical work area. When considered by clinical work area, nurses/midwives working in surgical and medical areas tended to regularly perform more neurological and peripheral vascular assessment including evaluation of speech, Glasgow Coma Scale (GCS) and inspection/palpation of extremities for oedema. Surgical nurses also regularly palpated extremities for distal pulses, capillary refill and temperature. Core skills used in oncology and maternity areas were similar to the 10 skills identified by the total sample, although nurses/midwives working in maternity also regularly performed abdominal inspection. Beyond selected vital signs, only mental status and speech were regularly assessed in mental health settings.

Table 2. Nursing Physical Assessment Core Skills (Median = 5) by Clinical Work Area

Skills *In Rank Order for Total Sample*		Total sample (n=434)	Surgical (n = 141)	Maternity (n = 57)	Medical (n = 119)	Oncology (n = 42)	Mental health (n = 34)
Rank							
1	Measure temperature using a thermometer	370/432 (85.6%)	139/141 (91.4%)	49/57 (86.0%)	104/119 (87.4%)	40/42 (95.2%)	25/34 (73.5%)
2	Measure SpO_2 using a pulse oximeter	369/432 (85.4%)	127/139 (91.4%)	46/57 (80.7%)	103/119 (86.6%)	40/42 (95.2%)	26/34 (76.5%)
3	Inspect overall skin colour/tone	328/431 (76.1%)	109/138 (79.0%)	42/57 (73.7%)	93/119 (78.2%)	33/42 (78.6%)	18/34 (52.9%)
4	Measure BP using sphygmomanometer	325/431 (75.4%)	108/138 (79.7%)	44/57(77.2%)	89/118 (75.4%)	39/42 (92.9%)	24/34 (70.6%
5	Measure BP using automatic equipment	323/429 (75.3%)	117/138 (84.8%)	42/57 (73.7%)	90/118 (76.3%)	25/42 (59.5%)	26/34 (76.5%)
6	Inspect skin integrity	299/430 (69.5%)	108/139 (78.3%)	35/57 (61.4%)	84/118 (71.2%)	31/42 (73.8%)	
7	Inspect wounds	277/431 (64.3%)	109/138 (79.0%)	37/57 (64.9%)	67/119 (56.3%)	25/42 (59.5%)	
8	Assess mental state/level of consciousness	262/430 (60.9%)	94/140 (67.1%)		81/119 (68.1%)	23/41 (56.1%)	20/34 (58.8%)
9	Evaluate breathing effort (rate, pattern, chest expansion)	245/425 (57.6%)	94/138 (68.1%)	29/55 (52.7%)	79/117 (63.2%)		
10	Inspect skin lesions	233/430 (54.2%)	83/137 (60.6%)		65/119 (54.6%)	27/42 (64.3%)	
11	Evaluate Glasgow Coma Scale		78/140 (55.7%)		68/116 (57.1%)		
12	Inspect/palpate extremities for oedema		69/137 (50.4%)		61/117 (52.1%)		
13	Evaluate Speech		75/139 (54%)		62/116 (53.4%)		19/33 (57.6%)
14	Palpate distal pulses for circulation		77/136 (56.6%)				
15	Palpate extremities for temperature		69/136 (50.7%)				
16	Palpate and inspect capillary refill		70/137 (51.1%)				
21	Inspect abdomen			28/56 (50.0%)			

Table 3 presents physical assessment skills, other than core skills, ranked by median scores for the sample. Eight additional skills (6%) were on average used frequently by the sample including cardiovascular skills, such as palpation of distal pulses, capillary refill, oedema, temperature or skin colour; and neurological assessment skills, such as pupillary assessment, evaluation of speech and GCS. Ten skills (7.5%) were used occasionally such as selected musculoskeletal and gastrointestinal assessments and gross inspection of hearing. Twelve skills (9%) were identified as being rarely performed. These included skills such as auscultation of lung sounds, inspection of jugular venous pulse and abdominal palpation for tenderness and distension. Of consequence, however, was the large number of skills on average identified as never learned (n = 69; 51.9%) and never performed (n = 24; 18%). These reflected physical assessment skills across a range of body systems, including skills such as percussion, auscultation and special techniques, or those requiring specialised equipment.

Table 3. Frequency of use of Physical Assessment Skills Other than Core Skills Ranked by Median Scores (N = 434)

Median = 4 I perform this skill frequently in my clinical practice (every 2-5 times I work)	Median = 3 I perform this technique occasionally (a few times a year)	Median = 2 I perform this technique rarely (a few times during my career)	Median = 1 I know how to do this technique, but have never done this in my clinical practice	Median = 0 I do not know how to do this technique		
In Rank Order • Evaluate Glasgow Coma Scale • Inspect/palpate extremities for oedema • Evaluate speech • Palpate distal pulses for circulation • Palpate extremities for temperature • Palpate and inspect capillary refill • Inspect extremities for skin colour/hair growth • Check pupils are equal and reactive to light	*In Rank Order* • Assess hearing based on conversation • Evaluate face movement and sensation • Inspect abdomen • Assess gait • Inspect external eyes • Inspect/examine stool • Assess muscle strength • Assess BMI through measurement of height and weight • Observe range of motion of joints • Auscultate abdomen for bowel sounds	*In Rank Order* • Sensation to light touch • Inspect facial structures • Inspect oral cavity • Inspect the spine • Inspection of groin area • Palpate abdomen for generalised tenderness, distension • Palpate extremities for tenderness • Palpate joints for tenderness • Inspect chest shape • Auscultate lung sounds • Inspection of anus • Inspect for jugular pulsation	• Inspect hair for colour and texture • Palpate lips tongue mucous membranes of mouth • Inspect/palpate internal ear • Assess visual acuity • Assess peripheral vision • Palpate lymph nodes in neck • Palpate chest wall for thoracic expansion • Percuss the lungs • Auscultate heart sounds • Auscultate carotid artery • Palpate the spine • Inspect muscles and extremities for size and symmetry • Inspect the	• Estimate body fat by measuring triceps skin fold • Estimate muscle mass by measuring mid-arm muscle circumference • Calculate waist to hip ratio • Evaluate olfactory nerve with smell test • Inspect internal nasal cavity with light source • Palpate maxillary sinuses • Transilluminate sinuses • Palpate TMJ • Palpate teeth • Inspect internal ear with otoscope • Assess hearing using whisper voice or finger rubbing test • Assess hearing	• Auscultate the chest for vocal resonance • Calculate ankle/brachial index • Inspect thorax for lifts/heaves of the heart • Palpate apical pulse or precordium (heart) • Percuss the chest over the heart for heart borders • Estimate-measure JVP • Assess range of motion to back/spine • Assess nerve root compression • Measure range of motion of joints with goniometer • Assess for carpel tunnel using Phalen's sign or	• Assess abdomen for fluid (shifting dullness/fluid wave) • Assess abdomen for a floating mass • Palpation of female genitalia • Internal genitalia (vaginal examination) with speculum • Palpate uterus to measure fundal height (in pregnancy) • Palpate fetal position (in pregnancy) • External palpation of uterus • Bimanual palpation of uterus

			breasts • Perform clinical breast exam • Inspection of female genitalia (hair distribution, vulva) • Inspection of male genitalia (pubic hair penis, scrotum) • Evaluate facial nerve (raise eyebrows, wrinkle forehead, show teeth, puff out cheeks) • Test for gag reflex • Test shoulders for muscle strength • Assess patient ability to hop on one foot • Assess patient ability to walk on heels/then toes • Finger coordination (each finger touches thumb rapidly) • Finger to nose test • Sharp/dull sensation	using Weber's test • Assess hearing using Rinne test • Assess hearing using audiometer • Assess extraocular muscles (6 cardinal fields of gaze) • Inspect corneal light reflexes • Inspect anterior chamber of eye with ophthalmoscope or penlight • Observe a red reflex • Perform internal eye exam with ophthalmoscope • Palpate thyroid gland • Palpate the trachea • Palpate chest wall for vocal fremitus • Percuss for diaphragmatic excursion	Tinel's sign • Assess for rotator cuff damage • Assess for knee stability • Assess for knee effusion • Auscultate abdomen for vascular sounds • Percuss the abdomen for abdominal tones • Percuss the abdomen to determine liver span • Percuss abdomen to determine spleen size • Palpate abdomen to assess for a mass • Palpate the liver • Palpate the spleen • Palpate the kidneys • Percuss costovertebral angle for kidney tenderness • Assess abdominal reflexes by stroking abdomen	• Palpation of cervix • Palpation of male genitalia (penis, scrotum) • Transluminati on of scrotum • Palpation of anus for rectal tone • Palpate anal canal and rectum for surface characteristics • Palpate prostate • Palpation for hernia • Test tongue for taste • Perform Romberg test • Vibratory sensation • Position sense • Two-point discrimination • Graphesthesia • Evaluate deep tendon reflexes • Stereognosis

Nurse/midwife and workplace characteristics associated with use of core physical assessment skills

The mean number of core skills by registered nurses/midwives and workplace characteristics is presented in Table 4. Skill utilisation differed significantly by clinical work area, with nurses in mental health areas reporting fewer skills (M = 6.3, 95% CI = 4.5, 8.7) compared to surgical (M = 14.2, 95% CI = 12.2, 16.4), medical (M = 12.1, 95% CI = 10.3, 14.1), oncology (M = 11.0, 95% CI = 8.7, 13.8) or maternity (M = 11.4, 95% CI = 8.9, 14.5) areas (F = 5.1, p < .001). Overall the pattern of results showed that as years of clinical experience increased, utilisation of core skills decreased. Nurses/midwives with greater than 10 years' experience used significantly less skills compared to other groups (F = 9.0, p < .001). Likewise registered nurses/midwives with postgraduate education (F = 3.6, p = .007) and those in senior clinical positions (Grade 6 and 7; F = 31.1, p < .001) used significantly less core skills on average. After adjustment for clinical work area, only clinical role remained significant. Nurse/midwives (Grade 5) used the most core skills (M = 12.9, 95% CI = 11.6, 14.4), followed by CNs (Grade 6; M = 8.5, 95% CI = 7.1, 10.1) and nurses/midwives in advanced practice roles (Grade 7; M = 5.0, 95% CI = 3.9, 6.4) used the least (F = 29.4, p < .001).

Table 4. Associations between Sample and Workplace Characteristics and Use of Core Physical Assessment Skills

Characteristic	*n*	Mean number of core skills	95% CI Lower	95% CI Upper	*F*	*p*-value
Sex						
Female	380	11.7	10.7	12.8	0.4	0.546
Male	40	10.7	7.5	15.0		
Highest level of education						
Hospital certificate	55	11.0	9.1	13.2	3.6	0.007
Bachelor's degree	265	12.8	11.7	14.2		
Postgraduate certificate	44	9.8	7.2	13.2		
Postgraduate diploma	25	11.3	7.0	17.8		
Master's degree	27	6.8	3.5	12.5		
English first language						
Yes	360	11.3	10.2	12.4	3.1	0.08
No	59	14.1	11.7	16.9		
Clinical role						
Registered Nurse/Midwife (Grade 5)	276	14.3	13.2	15.5	31.1	<0.001
Clinical Nurse/Midwife (Grade 6)	93	9.5	8.1	11.0		
Unit Manager, Clinical Nurse Consultant, Researcher/Educator (Grade 7[a])	51	5.3	3.2	8.5		
Clinical work area						
Medical	117	12.1	10.3	14.1	5.1	<0.001
Oncology	41	11.0	8.7	13.8		
Maternity	56	11.4	8.9	14.5		
Mental Health	33	6.3	4.5	8.7		
Surgical	135	14.2	12.2	16.4		
Other	36	9.0	6.3	12.7		
Employment status						
Full-time	187	11.3	9.7	13.2	0.3	0.592
Part-time	233	11.9	10.8	13.0		
Years of clinical experience						
≤ 3	70	15.2	13.4	17.2	9.0	<0.001
4-5	54	16.4	14.2	19.0		
6-9	77	12.3	10.3	14.7		
≥ 10	203	9.4	8.1	10.9		

[a] Grade 7 = advanced practice roles. *Note: Respondents who did not respond to at least 100 of the skills were excluded from this analysis. For any one category, the difference from the sample analysed and the total number averaged 1%.*

Perceived barriers associated with use of core physical assessment skills

Table 5 presents the associations between perceived barriers to physical assessment and use of core skills adjusted for clinical role and clinical work area. Moderate correlations were demonstrated between nurse/midwife-reported barriers to use of physical assessment and number of core skills including reliance on others and technology (r = -.30, p < .01), ward culture (r = -.22, p < .01), lack of confidence (r = -.22, p < .01), and lack of influence on patient care (r = -.20, p < .01). Weaker, yet significant correlations were also found for specialty area (r = -.13, p < .01) and lack of time and interruptions (r = -.12, p < .05).

Table 5. Associations between Barriers and Use of Core Physical Assessment Skills Adjusted for Clinical Role and Clinical work area

Barrier subscale	Regression coefficient (b)	95% CI		F	p-value
		Lower	Upper		
Reliance on others and technology	-.411	-.483	-.328	62.9	<0.001
Lack of time and interruptions	-.176	-.254	-.090	14.6	<0.001
Ward culture	-.265	-.348	-.172	25.7	<0.001
Lack of confidence	-.234	-.305	-.157	29.6	<0.001
Lack of nursing role models	-.126	-.208	-.035	7.1	0.008
Lack of influence on patient care	-.317	-.414	-.204	23.9	<0.001
Specialty area	-.149	-.245	-.041	7.0	0.008
Total barriers score	-.430	-.516	-.329	46.2	<0.001

Predictors of core physical assessment skill use

To determine predictors of core skill utilisation we conducted a multivariable analysis including all nurse/midwife and workplace characteristics and perceived barriers to physical assessment. The model was progressively reduced by eliminating variables that did not achieve statistical significance. Reliance on others and technology (F =

35.77, $p < .001$), lack of confidence ($F = 5.52$, $p = .019$), clinical work area ($F = 3.79$, $p = .002$), and clinical role ($F = 44.24$, $p < .001$) remained as significant predictors in the final model. Regression coefficients indicate that as reliance on others and technology (b = -.365, 95% CI = -.262, -.453) increase by one unit core skill use decreased by 36.5%. As lack of confidence (b = -.119, 95% CI = -.020, -.207) increases by one unit core skill use decreased by 11.9%.

DISCUSSION

Given the clinical and demographic profile of the contemporary acute hospital patient and increasing effort to achieve early recognition of clinical deterioration in this patient population this research is both timely and significant to inform optimum utilisation of nursing service. Our findings indicate that, on average, the physical assessment skill set that nurses/midwives regularly use in clinical practice is small and mainly comprised of routine vital signs. The results are consistent with previous studies although it is difficult to make direct comparisons for a number of reasons. For instance, earlier descriptive studies surveying frequency of physical assessment skill use included vital sign measurements as part of a skill set, with the skill sets ranging from 28 to 42 different physical assessment skills (Lillibridge 1999; Reaby 1990; Schroyen 2005; Sony 1992; Yamauchi 2001). However, it was difficult to extract raw data for comparison with our study due to the nature of categorising and reporting skill use frequency. Despite this, these cited studies all reported that vital sign measurements were skills performed most regularly, and by most nurses. More recent studies either did not specifically include vital signs in their skill list (Birks 2012; Giddens 2007) or it was unclear in the description of the individual skills (Secrest 2005). In both cases, regular assessment of vital signs by nurses may have been assumed. Our study findings suggest

caution is required in making such assumptions. We found that while vital sign measurements (temperature, blood pressure, breathing effort, oxygen saturation) are by far the skills *most consistently* (median = 5) used regularly, only approximately 80% of nurses/midwives reported taking patient vital signs every time they worked. This may be explained by the clinical work area in which the nurses/midwives worked, for example a mental health ward versus a surgical ward; a result which is not surprising given the patient profile of the ward. Clinical work area, in fact, was found to be a significant predictor of skill use in our study.

Recent trends in the patient assessment literature reflect the rise of scholarly discussions and empirical research on vital signs alongside that of early warning and rapid response systems. Arguments on the value of vital signs and the link to clinical deterioration, based on large prospective observational studies, are persuasive (Hong, Earnest, Sultana, Koh, & Ong 2011; Kyriacos et al 2011; Storm-Versloot et al 2014; Subbe and Sabin 2014). In a recent systematic review of 15 studies published between 1986 and 2012, including a total of 42,565 participants, Storm-Versloot et al (2014) found some discriminative positive likelihood ratios suggesting the clinical relevance of regularly measured vital signs. However the authors urged caution in interpreting the results because of the limited number of studies in the review, the large variation between patient groups and patient risk factors for adverse events, and the predominance of methodological flaws of many of the studies (Storm-Versloot et al 2014). Despite this, the primacy of vital sign measurement is evident in early warning and rapid response system tools and processes.

Vigilant surveillance and assessment of the patient's health status from admission to discharge are hallmarks of nursing practice. Yet, it is clear from our findings that the physical assessment skill set regularly used by nurses/midwives in daily practice has progressively grown smaller over time. We question whether this reducing set of core skills has become too narrow to be considered an adequate minimum data set for nursing assessment practice. Such a narrow set of physical assessment skills limits the utility of acute care nursing service in monitoring patient health status and timely and appropriate intervention. This leads to more questions about what other skills nurses should be performing regularly in order to ensure their assessment is capturing the necessary patient data to pick up subtle cues to changing health status that may provide the opportunity for intervention earlier in the patient care trajectory - before patients enter the clinical deterioration pathway. The factor that is rarely taken into account in interpreting findings from research into patient assessment is recognition that the human body has an internal system of homeostatic regulation which constantly monitors and adjusts in the face of changing conditions in order to maintain stability, balance or equilibrium. In light of this, and the position taken in interpretation of findings from this study, is that recognition of changing vital signs may well be considered a late sign that becomes evident once the body is no longer able to compensate for deterioration. Thus, our imperative to explore factors influencing patient assessment activities that occur along the continuum of hospitalisation, during which at any point in time, the patient may exhibit subtle signs of deterioration.

Vigilant surveillance and assessment of the patient's health status all through the hospitalisation remains undervalued, apart from the incorporation of routine assessment of vital signs as key criteria in tools aimed at detecting and thus preventing

clinical deterioration is almost universal. Two large observational studies found 10-20% of hospitalised patients experienced recurrent deterioration and met medical emergency call criteria more than once during their hospitalisation (Calzavacca, Licari, Tee, Mercer, Haase, Haase-Fielitz, Jones, Gutteridge, & Bellomo 2010; Stelfox, Bagshaw, Gao 2014). The track-and-trigger and early warning scoring tools target the immediate afferent limb of the clinical deterioration pathway. Despite some tools being able to display a visual depiction of vital sign trends, action may not occur in response to the trend, but to the single vital sign measurement occasion recorded outside of the acceptable range of normal. Reasons for lack of action taken while the patient is 'trending' toward deterioration, but while vital signs or early warning scores remain within the acceptable parameters, requires further study. This does not take into account other intrinsic or extrinsic factors that situate an individual outside of standard parameters of abnormal physiological status, such as advancing age and frailty, presence of comorbid chronic illness, invasive procedures, nutritional status, anxiety, stress, environmental conditions, medication, drug-drug or drug-food interactions, and fluid and electrolyte balance. Moreover, it is these other factors that contribute to the need for a comprehensive assessment of the patient.

We previously reported on the development and psychometric evaluation of an instrument to measure factors that nurses identify as barriers to their use of physical assessment skills (Douglas et al 2014). Our findings extend Birks and colleagues' (2012) list of barriers. In this study, after controlling for clinical role and work area, we found nurses use of physical assessment skills correlated significantly with each of the seven subscales (Table 5), further validating the tool as a useful measure.

After adjusting for age and experience, the four factors that emerged as *predictors* of the size of the physical assessment core skill set that registered nurses/midwives would use regularly in practice were clinical role and clinical work area, lack of confidence and reliance on others and technology. We found that the physical assessment core skill set for nurses/midwives in more senior roles, with more years of experience, and higher educational qualifications was smaller than that of university-prepared, less experienced frontline registered nurses. This is counter to the assumption that skills will increase with experience and specialisation as proposed by Giddens (2007). We found nurses use less physical assessment skills as they move forward in their professional career. While this may simply be due to more senior nurses having less patient contact, this phenomenon reflects the trend over the past 10 years of the ever decreasing size of nurses'/ midwives' physical assessment core skill set (Birks et al 2012; Giddens 2007; Secrest 2005). Both trends may be inextricably linked to changing practices in acute care.

It is noteworthy that our study confirmed physical assessment core skill set varied by clinical work area of practice. Registered nurses working in surgical and medical wards, by far, used more core skills; and mental health nurses were using a much smaller skill set. This leads us to consider the value of developing a minimum data set of core skills for all registered nurses and then identifying additional clusters of skills to be used in specialty-specific areas. Jones et al (2013) discusses institutional, patient and physiological factors that put patients at risk; recommending that patients should be assessed for risks that could put them on the path to deterioration. This has implications for advocacy and support for a population-specific, symptom-driven

assessment approach for patients at risk for complications; thus, endorsing the 'core-plus cluster' skill set for nursing clinical specialty practice.

Reliance on others and technology also emerged as a predictor of physical assessment skill use in our study. This reflects nurses' and midwives' disinclination to integrate physical assessment in the face of the tension surrounding professional boundaries between medicine and nursing (Douglas et al 2014). Secrest (2005) argued that the medical model drives the culture of physical examination, and thus physical assessment techniques are designed for diagnostic purposes. However, Fennessy and Whittman-Price (2011) contend that diagnosing is within the realm of both disciplines, and that it is to what end that differentiates medicine from nursing; but for both, patient assessment precedes diagnosis. Nurses diagnose by interpreting data obtained through thorough, comprehensive, on-going and responsive health assessment, which includes the use of physical examination techniques. Zambas' (2010) puts forth another proposition against nurses crossing the boundary of physical assessment in arguing that physical assessment "directs attention away from getting to know the patient and individual patient change" (p309). However, we maintain that it is the very act of spending time getting to know the patient on a daily basis that provides the occasion for assessment to take place and the opportunity to identify those subtle cues to changes in the patient's health status. Thus, physical assessment is a mainstay of planning effective nursing care.

Coupled with concern about overstepping disciplinary boundaries, technological advances in health have undoubtedly had an impact on nurses' assessment practices. The acceptance of technology, that is, electronic monitoring equipment, as a

replacement for physical assessment skills, has also been shown to be a predictor of decreased core skill set in our study. Whether this stems from a view that 'physical assessment' means only taking vital signs or whether vital signs are seen as the only physical assessment data nurses' and midwives' feel they need to care for patients requires further exploration. It is troubling that our study identifies use of technology as a barrier to physical assessment which may imply an over reliance on technology to the detriment of the use of nursing observation skills.

Reliance on others and technology is also connected to perceived lack of confidence in performing physical assessment skills. Lack of confidence can be contextualised as self-efficacy, or a person's belief in his or her capability to successfully perform specific tasks (Bandura 1994), such as physical assessment activities. Applying Bandura's theory of self-efficacy, strong self-efficacy expectations will develop from mastery experiences (performing physical assessment skills) and vicarious experiences (seeing others model physical assessment skills). Theoretically, the more nurses and midwives use physical assessment skills, the more proficient they become and the more confidence they have in their abilities to use physical assessment skills. However, the reverse, can lead to a cycle of less use; that is, less use of physical assessment skills leads to less opportunity to increase confidence which means less use of the skills. In light of the complexity of the culture and context of nursing assessment practice, further research is needed to determine which of the two, reliance on others and technology or lack of confidence, fuels the other. In any case, a picture emerges that is consistent with our hypothesis of progressive deskilling over time.

Implications for Nursing Practice

What we know from this study is that nurses are not regularly incorporating comprehensive assessment into their everyday practice. What is desirable is for nurses to practice consistently at a high level of patient surveillance, despite the reactive introduction of new processes, such as early warning and rapid response systems. Nurses must maintain a practice ethic that goes beyond the imperatives of the organisation. Ongoing surveillance and diligent responsive assessment is essential to planning nursing care, we argue that it needs to remain at the centre of nursing practice. The imperative to extend nurses/midwives core physical assessment skill set beyond vital signs and elevating the utility of comprehensive assessment is driven by the changing acuity of the contemporary hospital acute care ward patient. Incorporating additional subsets of skills related to clinical work area of practice has implications for a core+cluster approach to nursing/midwifery assessment practice. Intervention studies are warranted to increase the scope of nursing/midwifery assessment practice and to link assessment practice to patient outcomes. Other factors at play that need further exploring, include the influence of the culture, climate, and the inherent complexities of the context in which nurses and midwives practice.

The findings of this research indicate that nursing practice is directed toward collecting and reporting minimal data that will detect end stages of clinical deterioration. We argue that this, in part, is a response to the current hospital safety agenda, which in this area is driven by early warning and rapid response systems, and relies on nurses collecting data according to predefined parameters rather than concentrating on assessment of patient health status. Nurses are not adequately using the range of assessment skills according to patient population and clinical work areas in light of the nature of the contemporary patient profile - older patients with existing comorbidity,

admitted with higher acuity, and discharged after shorter lengths of stay. This could have unintended consequences – cardiac arrest, unplanned intensive care admissions or patient death. We have identified some predictors of the use of physical assessment skills; however, a closer examination of the organisational factors that may be influencing the capacity for nurses to practice to the full extent of the scope of the registered nurse is warranted.

Limitations

The findings were obtained using a self-report survey tool. Surveys are efficient and relatively inexpensive to administer. In addition, participants are generally the best qualified to possess information about themselves, their behaviour and their perceptions about issues; however, other motivations may influence responses. Further studies observing nursing assessment practice would validate our findings. Finally, at the time of the survey, the hospital was in the midst of a period of radical change and adjustment as a result of a number of cost-cutting measures imposed by the government onto the health department, including reduction in services and cuts to the nursing workforce. These factors may have influenced participants' perceptions of their work practices.

CONCLUSION

The increasing acuity profile of the contemporary acute care ward patient mandates for more vigilant patient surveillance. However, our study suggests that nurses are drawing on an increasingly diminished physical assessment skill set. In some ways this is not surprising, in light of the global focus on implementing institutional measures to detect clinical deterioration such as the use of early warning and rapid response systems;

systems integrally directing collection of vital signs by front line clinicians. What is concerning is the acquiescent use of vital sign derangement, as dictated by early warning systems, as the optimal cue for patient deterioration, to the detriment of the value of recognition of subtle trends in changing patient status that may be picked up earlier in the patient's admission process through vigilant nursing assessment and surveillance. Additionally, the more nurses view physical assessment as not part of the nursing role or as solely the domain of medicine or allied health, the greater the tendency for a decreased core skill set. This research raises questions about the influences on the contemporary nursing context which constrains patient assessment practice.

CONTRIBUTORS

- Research Assistants (Mary Batch, Olivia Hollingdrake) – design of study materials, conducted hospital-wide participant information sessions, acquisition of data, data entry, and data management.

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